

boundary between mechanics and mathematics, on the one side, and between mechanics and physics on the other, must have given some trouble, but this kind of problem seems to have been dealt with fairly satisfactorily. The difficulties of internal classification, on the other hand, are most perplexing and baffling. One constant source of difficulty is that the mere title of a paper often gives a wholly inadequate, or even a misleading, notion as to its real scope; the same paper may, moreover, contain matters which in any complete system of classification would fall under quite distinct headings. As regards papers published since 1883, the editors have attempted to deal with this point, and we are told that in all such cases the contents have been examined by experts. It is unfortunate that the same process could not be extended backwards so as to cover the whole century, but the labour involved would have been enormous, and the result at the best imperfect.

The schedules adopted as the basis of classification are those of the International Scientific Catalogue, but a number of subheadings have been introduced. These are printed in a somewhat aggressive type, and distract attention perhaps as much as they assist it; indeed, we have found that some little practice is necessary before the volume can be used with effect. It is possible to set oneself some rather interesting problems in hunting up known papers; we may suggest, for instance, a search for references to Hamilton's memoirs on varying action, Kirchhoff's theory of the vibrations of a circular plate, or his experimental method of determining elastic constants, and Hertz's paper on the pressure of elastic solids in contact. These are, of course, all in the book, but they may take some finding.

It would be ungracious to dwell further on imperfections which must occur on almost any practicable system. It is pleasant to turn to points which can be commended without reserve. The list of serials which have been used for the purposes of the work, and the indication of the more important British libraries where these are to be found, will save much trouble to scientific workers. Very welcome, also, as well as important from the point of view of scientific history, are the references to biographical articles; these seem to be especially full and complete. The lists of general treatises, tables, public addresses, and books on apparatus strike us, on the other hand, as somewhat meagre. Possibly they are merely receptacles for a few odd items for which place could not be found elsewhere.

When all is said, an index to the mechanical literature of the whole nineteenth century, drawn up on a consistent plan, cannot fail to be an enormous boon to students and investigators. These are once more under a deep obligation to the Cambridge University Press, which has undertaken the complete risk of printing and publishing the work. We would endorse the closing words of the preface, which express a hope that the scientific world generally will "use their best endeavours that this public-spirited action shall not result in financial loss."

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SHELL-FISH INDUSTRIES.

Shell Fish Industries. By Prof. J. L. Kellogg. Pp. xvi + 361. (New York: Henry Holt and Co., 1910.) Price 1.75 dollars net.

IN this work Prof. Kellogg gives a very interesting account of the shell-fish industries of the United States, and also a very valuable summary of our present knowledge of the morphology and life-histories of the edible molluscs which form the material of those fisheries. The keynote of the book is the insistence on that waste of great natural resources, and indifference to the needs of the future which have characterised American exploitation. Past generations may have believed that the natural wealth of the continent was inexhaustible, but the present one, by mercilessly clearing up what remains, has established a record of waste which is probably without parallel in the history of peoples. The picture of wastefulness and lawlessness presented by the account of the great Chesapeake oyster fishery given in this book will seem almost incredible to European readers—even to those who know how State control of the sea-fisheries has generally given origin to a mass of futile and vexatious legislation. We read of insufficient surveys resulting only in insecure titles; of conflicting laws; of the utilisation of political machinery to secure immunity from State interference; and of an entirely inefficient fishery police. The earlier oyster-dredgers are described as being commanded by "as merciless a band of pirates . . . as ever ruled a deck on the high seas," and manned by "vagrants, thieves, and murderers," or by newly arrived and ignorant foreigners. The crews of these vessels suffered "abject slavery" and "unspeakable cruelties." They formed "one of the most depraved bodies of workmen to be found in the country." The Baltimore vessels "established a record of crime and cruelty such as has rarely been equalled." The fishery was entirely the exploitation of originally very rich natural beds, and it is not surprising that depletion of these has taken place to such an extent that many areas are now barren.

The natural reaction to such a condition of affairs is scientific investigation, competent and honest surveying, and the study of methods of cultivation. This side of the question is illustrated by an account of the great oyster fisheries in Long Island Sound and adjacent waters. Here State control has suppressed disorder, and has established security of tenure in the case of the partition of the sea-bottom among the holders. Methods of cultivation—seeding, culling, deposition of cultch, and destruction of starfish and other oyster enemies—have made the sea vastly more prolific than in natural conditions; and so we find an output of enormous proportions, and steam dredging vessels without parallel elsewhere among fishing nations. The same line of development is already indicated in the case of other American shell-fisheries.

The parts of the book dealing with these matters—the history of the industry and the methods of cultivation—will prove most interesting to general readers and to those who study fishery questions, but the purely scientific chapters in Prof. Kellogg's book are

also of great value. The first three chapters, and some later ones, give a good account of the life-histories of the oyster, the clams (*Mya* and *Venus*), and the scallops (*Pecten*). One chapter deals with the ciliary mechanisms in some of these animals, and, being based on original observations, contains much that will probably be new to most zoologists. There is also an interesting chapter on bivalve molluscs in relation to human disease. Prof. Kellogg's book may confidently be recommended to all biologists interested in the economic side of their science. J. J.

THE FAUNA OF CEYLON.

Über die Geschichte der Tierwelt von Ceylon. By F. Sarasin. Zool. Jahrbucher, suppl. 12, part i. Pp. 160. (Jena: G. Fischer, 1910.) Price 7 marks.

SINCE this elaborate piece of work embodies the results of the biological investigations undertaken by the Messrs. Sarasin in Ceylon during a protracted period, it has good claim to rank as the most authoritative attempt to explain the origin and relationships of the fauna of that island yet published. It is, however, really more than this, as it embraces a survey of the relationships and probable migrations of the faunas of south-eastern Asia generally, and their connection with that of Africa. Very valuable are the details given with regard to the geographical range of the various genera of mammals, reptiles, molluscs, planarians, and worms constituting the Ceylon fauna. Ceylon, which long formed a portion of "Gondwanaland," and is thus of great antiquity, appears to have been isolated from the Indian mainland during the whole or the greater portion of the Pleistocene period.

From this antiquity—in which the island presents a striking contrast to Celebes—the fauna of Ceylon displays unmistakable evidence of a very mixed origin, both as regards space and time. Not fewer than three epochs of connection between the Oriental region and Africa have left their impress on the Ceylonese fauna, one of these periods of union being pre-Cenomanian, while a second was Siwalik. Special emphasis is laid by the author on the part played during the Eocene in the evolution of the fauna of Ceylon by the irruption of the Deccan traps, which for a considerable period formed an impassable belt, dividing the peninsula into a southern area, including Ceylon, and a northern area. Even after the cessation of volcanic activity, communication between these two areas was greatly restricted, consisting of one track on the western and another on the eastern side of the peninsula, and even then practicable only to animals capable of withstanding a considerable amount of drought. The Siwalik connection the author considers took place by way of Baluchistan, Persia, Arabia, and Syria, or possibly to the south of Arabia by way of Socotra; and the author agrees with Dr. Arldt that the connecting area was originally clothed with forest, and that the affinity of the faunas of the African forest-zone, the Malay countries, and southern India and Ceylon may be accounted for by the subsequent deforestation of the tract, and the

retreat of the animals to districts where suitable conditions still remained.

Dr. Sarasin likewise admits a former connection between Ceylon and eastern Africa and Madagascar; but considers that a chain of islands will explain the facts of the case, and that recourse to a continental "Lemuria" is quite unnecessary. He likewise accepts a connection with the Malay islands, probably by way of the northern part of the Bay of Bengal, and has also something to say with regard to the South American affinities of the Indo-African fauna. In Ceylon itself the older forms of life, such as planarians, worms, and molluscs, have a very different distributional history from those of the later mammals, and thereby present another contrast to Celebes, where the advent of all was synchronous. A valuable digest of the previous literature concludes this excellent piece of work. R. L.

THE PHILOSOPHY OF EXPERIENCE.

The Principles of Pragmatism: a Philosophical Interpretation of Experience. By H. Heath Bawden. (Boston and New York: Houghton Mifflin Co., 1910.) Price 1.50 dollars net.

THIS is an altogether admirable exposition of the views which are usually associated with the names of Peirce, James, and Dewey in America, and Schiller in England. It does not claim to construct a system, but only to show how we may establish the basal conceptions of a new philosophy of experience.

Pragmatism is the reaction from a speculative philosophy which was out of touch with the affairs of men. The practical man follows with interest the development of a working hypothesis in science, but is impatient of speculations on the infinite and eternal. He values thinking, but he insists that thought shall keep close to experience. He has no use for empty abstractions. The metaphysician has spun a universe out of his own inner consciousness, and tries to make the facts fit his system. The pragmatist seeks the cooperation of the man of science in constructing a philosophy which shall be accurate in method and shall fit the facts.

Philosophy must start, not with a great First Cause or absolute, but with concrete, workaday human life. It must try to understand experience here and now, and from that as a basis proceed to work outward to the metaphysical problems. All the problems of origin and destiny need to be re-stated in terms of present experience. Such a procedure, if it does not much reduce the number of mysteries which lie about us, will at least save us from multiplying them unnecessarily.

The question of immortality, for instance, turns on the nature of individuality. In spite of all the arguments—theological, intuitional, revelational, ethical, and what not—most persons find their faith in a future life scarcely more than a wish. Why? Because the self for whose immortality they hope is an unreal abstraction.

"The self is conceived as a particularistic entity, with barriers to other selves. While, in society, indi-